

3-Layers Myocardial Strain in Normal Subjects and in Patients with Wall Motion Abnormalities. A Novel Speckle Tracking Software

Marina Leitman¹, Michael Lysiansky², Peter Lysyansky³, Zvi Friedman³, Vladimir Tyomkin¹,
Dan Adam², Zvi Vered¹

¹ *Department of Cardiology, Assaf Harofeh Medical Center, The Sackler School of Medicine, Tel Aviv University, Zerifin, Israel,* ² *The Technion Institute of Science, Haifa, Israel,*
³ *General Electric Healthcare, Israel*

Purpose: The left ventricle is composed of 3 layers of fibers that provide LV contraction. Different techniques have allowed measurement of transmural myocardial strain. Circumferential movement of the endocardial and epicardial layers permits measurement of strain in myocardial layers: endocardium, midlayer and epicardium.

We measured circumferential and longitudinal strain in 3 myocardial layers with modified 2D strain speckle technique.

Methods: 20 subjects with normal LV function and 11 patients with wall motion abnormalities underwent echocardiographic examination. Short axis and apical views were analysed with a novel modified 2D strain speckle technique that is capable of measurement of longitudinal and circumferential strain in 3 myocardial layers.

Results. In normals longitudinal and circumferential strain was highest in endocardium, and lowest in epicardium in all levels. Longitudinal endocardial and midlayer's strain was highest in the apex and lowest in the base. Epicardial longitudinal strain was homogenous over the LV. Circumferential strain was highest in the apex and lowest in the base in all 3 layers. Longitudinal and circumferential strain in abnormal segments was of lower amplitude, with late diastolic peak, and double peak. Tethered segments had significantly lower strain than corresponding segments of normals.

Conclusion: LV longitudinal and circumferential strain are highest in the endocardium and lowest in the epicardium. Circumferential strain is highest in the apex and lowest in the base. Longitudinal endocardial and midlayer strain are highest in the apex and lowest in the base, longitudinal epicardial strain is uniform over the LV.